



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE EFFECTS OF THE FREEZE OF FEBRUARY 2-4, 1917 ON

THE INSECT PESTS AND MITES ON CITRUS.*

By W. W. YOTHERS, Bureau of Entomology,
Orlando, Florida

WEATHER CONDITIONS AND TEMPERATURES

For more than five weeks prior to February 1st, the weather had been very warm. Many days the temperature reached 85° F., at Orlando, Florida, and on February 1st it reached 86° F., and it was a very sultry, calm day. Between 6 and 8 o'clock p. m., about half an inch of rain fell and there was more or less rain the entire night. The rain was followed immediately by a heavy wind from the northwest, which continued until late Saturday afternoon. It was quite calm, however, Saturday night.

The following minimum temperatures of localities, where examinations were made to determine the conditions of pests, were taken from the U. S. Weather Bureau :

Putnam County, Crescent City	19°F.
Volusia County, DeLand	15°F.
Marion County, Ocala	18°F.
Lake County, Eustis	20°F.
Orange County, Orlando	22°F.
Polk County, Winter Haven	25°F.
Polk County, Frostproof	27°F.
Pinellas County, Pinellas Park	27°F.

The zone of the lowest temperatures, from 15° to 20° F., comprise the citrus producing counties of Putnam, Volusia and Marion, with parts of Lake and Orange. In this zone there was practically complete defoliation of all citrus trees. Many grapefruit trees were killed to the ground and the oranges were killed back to within, from 4 to 8 feet of the ground. Hare in his report on the effects of the freeze† gives the following estimates of the percentage of the bearing wood that had been killed:

	Oranges	Grapefruit
Putnam County	80%	90%
Volusia County	90%	95%
Marion County	75%	85%
Part of Lake County	30%	40%
Part of Orange County	40%	50%

*Published by permission of the Chief of the Bureau. Read before the Florida Entomological Society October 10, 1917.

†Hare, C. C., "Report on Effects of the Freeze." U. S. Bureau of Crop Estimates.

The Florida Buggist

Official Organ of the Florida Entomological Society.

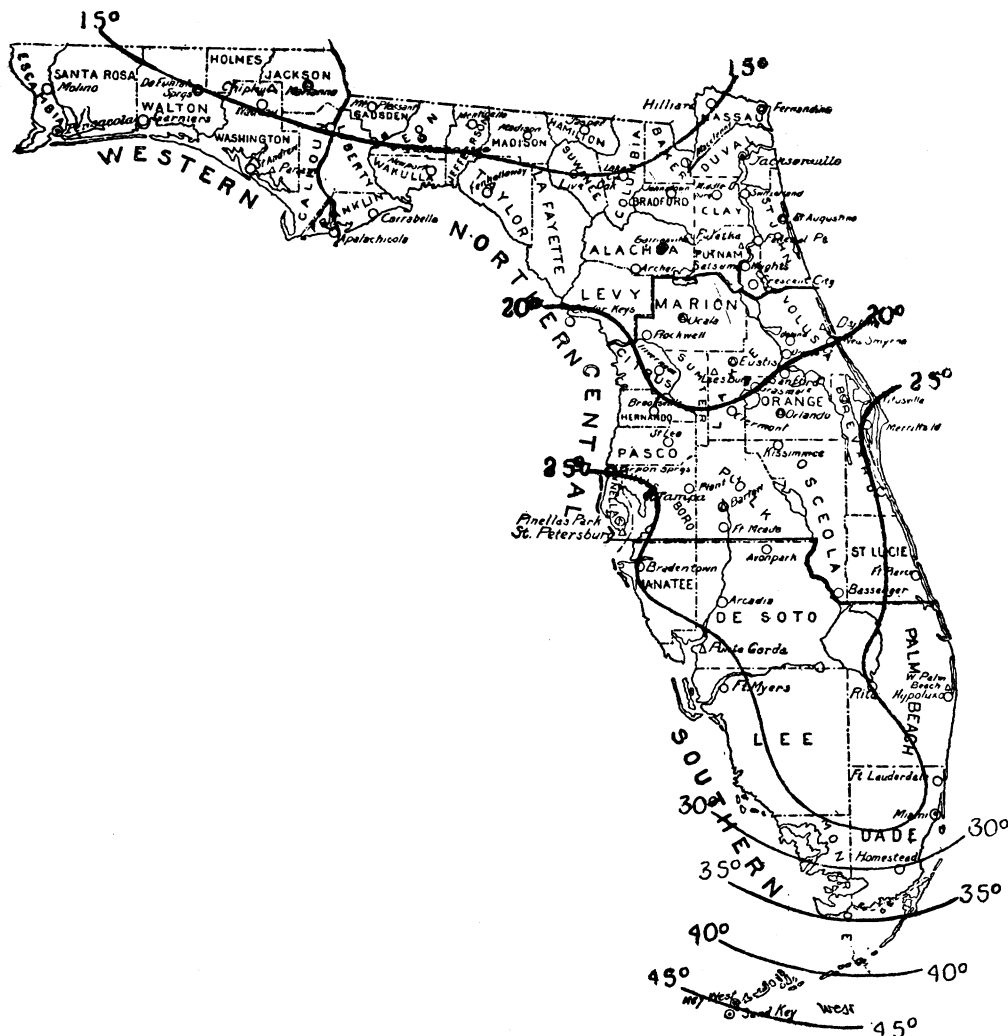
VOL. I

WINTER NUMBER

NO. 3

December 21, 1917

LOWEST TEMPERATURES DURING THE COLD WAVE. ISOTHERMS
DRAWN FOR EVERY FIVE DEGREES.



*From U. S. Weather Bureau, Jacksonville, Fla., Feb., 1917.

The counties comprising the next warmest zone—temperatures between 20° and 25°F.—with the percentage of bearing wood killed as follows:

	Oranges	Grapefruit
Lake County	30%	40%
Orange County	40%	50%
Osceola County	20%	25%
Polk County	20%	30%
DeSoto County	25%	35%
Manatee County	20%	25%
Lee County	25%	35%

In this group there was about 90 to 95% defoliation of orange trees except in a few protected places. The grapefruit trees were completely defoliated.

The warmest of the three zones—temperatures between 25° and 30°F.—comprises the following counties with the percentage of bearing wood killed:

	Oranges	Grapefruit
Pinellas County	10%	15%
Dade County	5%	10%
Palm Beach County	0%	0%
St. Lucie County	0%	0%
Part Brevard County	15%	20%

The defoliation in this group was not sufficient to influence the number of white flies or other pests to a degree to be of economic importance.

CONDITION OF THE CITRUS TREES AT THE TIME OF THE FREEZE

Owing to the prolonged period of warm weather, citrus trees were in a growing condition. So far as can be determined, the condition of growth was in the same state of advancement in every part of the state. Grapefruit trees, especially, were in the full flush of growth. Orange trees were also growing, and many were in full bloom. Tangerine trees had not reached the advanced state of growth of either the grapefruit or orange trees, but some growth was taking place. Young trees, especially, were growing vigorously. It is due to this condition of growth that the trees were injured so severely. Tangerine trees, being quite dormant, were not damaged very seriously and if other citrus trees had been equally dormant, little damage would have resulted from the cold.

The cold wave not only seriously damaged the citrus and other semi-tropical trees and shrubs, but also it was of the greatest importance in reducing the numbers of injurious pests which infested the trees. Some of these were frozen outright, while others were affected when the plant was defoliated or killed.

THE CITRUS WHITE FLY (*Dialeurodes citri* R. & H.)

It has been known for many years that low temperatures do not kill the citrus white fly. It survives on privet in the temperatures of North Carolina, and the recent cold wave did not injure this species on privet in any section of the State. It is very doubtful if the recent freeze in Florida has directly killed any pupae of the citrus white fly. The defoliation of citrus trees, however, has resulted in reducing the number in many places and localities to the point of almost complete extermination. This is especially true in all the counties of group one. In Putnam and Volusia Counties the only specimens of white fly pupae were found on privet, or in groves that had been fired. In Marion, and parts of Lake and Orange Counties, a few survived, but not sufficient to be of importance for at least a year. This cold has given the white fly such a severe setback in these counties that it will be many years before it will become as abundant as formerly. Examinations made October 3rd still showed this pest to be very scarce in this temperature zone. No spraying has been necessary to control this pest this season. There were a few groves that were fired from which, and the privet, the white fly will re-infest all the groves in the community.

Since there were scattering leaves left on thousands of trees, there were many more of the citrus white fly in the counties of groups 2 than group 1. Probably not more than 1 pupa in 1000 emerged. On October 3rd the white fly was about as abundant as if no freeze had occurred, and much sooty mold appeared on the trees. Many groves should have been sprayed during October and November to control this pest.

In the warmest zone examinations were made only in Pinellas County. Although there was considerable defoliation, it was not of any great importance in reducing the numbers of the white fly. On May 10th there were many groves that needed to be sprayed for this insect. On October 3rd the white fly had blackened many groves. More perhaps were present than at any time since its first appearance in this section.

THE CLOUDY-WINGED WHITE FLY (*Dialeurodes citrifolii*
MORGAN).

This species infests only citrus and is found largely on grapefruit. Since the grapefruit suffered such a complete defoliation in the counties of both groups 1 and 2, and a much greater defoliation in group two than oranges, this species of white fly has

not been much in evidence since the freeze. It is more than likely that it will be sometime before it again becomes a seriously injurious pest in the counties of groups 1 and 2. In group 3 it was abundant October 3, 1917.

The injured leaves fell from 10 to 14 days after the frost and dried up in the course of a day or two afterwards. Owing to the length of time the freeze occurred before the regular period of emergence of the white flies, none were observed to emerge from the leaves that had fallen. The freeze evidently shows that the white flies are much more resistant to cold than the citrus trees, and were destroyed only in proportion to the extent of the defoliation.

THE PURPLE SCALE (*Lepidosaphes beckii* NEWMAN).

In the counties of group one this pest was almost exterminated. Since practically all the leaves were lost and a majority of the trees had nearly all the branches killed back from three to six feet, there was little chance for the survival of this species. In addition, many were actually frozen. So far as could be observed, the eggs were not frozen sufficiently to prevent them from hatching, so those which were located on the larger branches will hatch and re-infest the trees. A few living females were observed at Crescent City on some old fruit, still on the trees. No living scales other than these were observed in several days' search, from May 3rd to 6th, and again on May 24th. There was considerable scale on some fruits in October. Reports indicate that this scale insect has become fairly abundant in November, 1917.

In the counties of group two, this insect also received a most severe setback, but not to the extent that it did in group one. All insects on the fallen leaves, as well as those on the dead branches, were killed and all young scales frozen. On February 20th an examination of ten fallen leaves, but still green, was made. 150 young scales were dead and one female living. On two dried leaves 2 dead adult females, 1 living adult female and 11 dead young scales were found. If this leaf had been left a day or two longer, the living female would also have been dead. No young scale have been observed up to June on the new growth at any place in this group of counties. The trees, as a whole, are remarkably free from scale, due no doubt, to the effects of the freeze. At the present time (October) this species is quite abundant and not far from normal infestation.

In the warmest of the three groups the defoliation and the mortality, as the result of the freeze, has been the cause of greatly reducing the number of scales, but not to the extent as to make spraying this spring unnecessary. In Pinellas County there were many young scales and crawlers observed on May 10th. On October 3rd, 1917, this pest was most abundant. No indications were present that any had been killed by the frost.

RED SCALE ON CAMPHOR (*Chrysomphalus aonidum* L.).

It was impossible to make observations of this scale on citrus, so the examinations were made where it infested camphor. Since the camphor did not lose its leaves from frost injury, the examination showed how effective the cold had been in freezing the scales instead of killing them by damaging the foliage. On February 7th, or 4 days after the frost, extensive examinations showed that nearly all stages except the eggs had been hurt by the frost. The adult females did not have a normal appearance.

On February 16th examinations of 250 adult females, 11 immature stages and 6 males were dead and 5 adult females and 9 immature stages were living. It was noticeable that more than 25% of the adult females had dead crawlers beneath the scale covering. It was also noticeable that they had died very recently, since they were not dried up at all, but had just turned brown during the previous week. From another tree there were 100 adult females, 60 immature and 14 males killed by the frost, and 5 adult females and 9 immature stages living. Dead crawlers beneath the scale coverings were also present. The two examinations give 94% dead and 6% living. No doubt the percentage of dead was greater since many of the young stages including the crawlers were not counted.

On June 1st there was considerable red scale on the camphor trees from which the leaves were taken for the above examinations. Both on October 3rd and December 2nd as many were present as if no reduction in numbers had taken place.

The frost also killed this scale on privet. On February 17th I found 25 adult females dead and none living. Three of these had eggs with a normal appearance, and one of these three had crawlers. There were not more than 15 eggs with normal appearance and many females had dead crawlers near the opening. On June 1st not a single specimen of red scale could be found on the privets that were examined last spring. On December 12 there are no red scale on these same privets.

When one takes into consideration the mortality suffered by

this species on camphor and compares it with the possible mortality it suffered on citrus, from both defoliation and low temperatures, it is very doubtful if more than one insect in ten thousand survived. In fact, it would be nearer the truth to say that not more than one in a hundred thousand survived the cold.

It has been impossible to make observations on this species in group three.

THE RUST MITE (*Eriophyes oleivorus* ASHM.)

At the time of the cold wave there was an abundance of mites present; many more than is ordinarily the case at that season of the year. These were partially frozen and partially killed because the foliage was shed.

Examinations were made at Orlando during the cold wave, on February 3, or after the first cold night, and before the second one. No mites could be found on a small sour tree, located in an exposed situation, on which many thousands had been present all season previous to the frost. On February 7th examinations of green leaves, still on the trees, showed the mites were very scarce compared with the number present before the frost.

The rust mite cannot live on dead fallen leaves. On February 10th green leaves picked up from the ground were examined and no living mites were found. On the same day 17 living mites and three eggs were found on 10 leaves from a tree in a protected location. On 24 green leaves from the trees, 4 living mites were found and from 17 green leaves picked from the ground, 1 living mite was present. No mites were ever found on dry leaves. There is no doubt that the rust mites present on the trees and fruit now are the progeny of those that survived on the leaves uninjured by the frost.

In the counties of group one the mites were nearly exterminated. Those that were not actually frozen perished with the drying of the leaves. In examining six groves, May 3 to 6, in two days only two mites were observed. In a normal infestation there would have been literally billions present. In Marion County, on May 24th, they were also extremely scarce.

In the counties of group two they received a severe setback. A conservative estimate of the mortality would be more than 99%. In fact, on June 1, or more than four months after the frost, they have only become as abundant as they were before the cold wave. Since the freeze the weather has been extremely favorable for the reproduction of the mites, and this pest is so abundant

(Continued on page 38)

Mr. W. W. Yothers of the Orlando Laboratory, U. S. Bur. Ent., was married on December 6 to Miss Ada Bumby of Orlando.

Prof. J. R. Watson while passing through the fair city of Arcadia a few weeks ago had to wait on the E. & W. C. train; not being acquainted in the city, and in order to while away the time, he secured his insect net and decided to collect a few membracids and other insects around town.

Some of the older settlers not being familiar with the work of an entomologist at once reported his actions to the mayor. Mayor Royal while on his way to the scene of action met Sheriff Dishong, and the two officials after viewing the strange actions of the "German Looking Fellow" from a distance decided that something was radically wrong, so he was at once taken into custody. Upon searching his baggage a number of bulletins were found and his identity established. Professor was very angry, but his pardon was begged and he went on his way to Bradentown.—*Correspondent.*

Note:—Lucky for the Professor that he did not have a stray copy of *The Jeffersonian* in his baggage, or that the zealous but uninformed officers did not find his insect-poison bottle.

THE EFFECTS OF THE FREEZE OF FEBRUARY 2-4, 1917 ON THE INSECT PESTS AND MITES ON CITRUS.

(Continued from page 35)

now in nearly every part of this group of counties that spraying should be done if bright fruit is to be obtained. The only result in the reduction of the mites by the freeze has been the postponement of the time of maximum infestation in these counties about a month or six weeks.

In the localities of group three they were also greatly reduced in number but not sufficiently to be of any great economic importance. Spraying had to be resorted to at about the same time as in an ordinary season.

By late July and early August the rust mite had become very abundant. In fact, it is generally believed now, that there were more present than ever before in the history of the citrus industry. On October 3rd, however, the species is very scarce. Several groves were examined the first of October and only a few hundred were found. The almost complete extermination of this species by the freeze and its reproduction to billions in six months is a most remarkable biological fact. According to computation,

one mite would have a progeny of about 12 million in about 5½ months, and I believe this is just about what actually took place. We saw many grapefruit with an estimated number of half a million, and this condition was the same over the entire state. The "sands of the sea" or "the stars of heaven" are the only expressions that will enable one to understand how abundant this species actually was the last of July and early August.

RED SPIDERS (*Tetranychus sexmaculatus* MCGR.)

No opportunity has been offered to determine the effects of the freeze on this pest. Few were present at the time and few have appeared this season. In fact, they have not been so abundant this season as normal.

THE PURPLE MITE (*Tetranychus citri* MCGR.)

So far as could be ascertained, the adults did not appear to have been hurt. The eggs, however, had a very soft and unnatural appearance. Since the freeze this pest has not been very abundant and this is, no doubt, due to the eggs being injured by the cold.

ORANGE APHIDS

The aphids infesting an orange tree before the freeze were dead on February 7th. No eggs were present in the colony. This was the same condition as was observed by Hubbard in 1895.* Since the freeze, however, there have been more aphids on the young sprouts than during any other spring in my recollection. These were soon killed by parasites and predaceous enemies and were of little economic importance.

EFFECT OF THE FREEZE ON THE PESTS OF OTHER PLANTS THAN CITRUS.

Tenuipalpus bioculatus MCGR.

This species on privet was slightly, if any, damaged by the cold. Living specimens were found February 17th. These, however, may have been hatched since the cold.

Tetranychus yothersii MCGR.

This species on camphor seems to have been very seriously hurt. On February 7th the adults were nearly all dead. Only a few showed any signs of life, such as moving their legs, and only one on the entire lot of leaves was active. The eggs also did not appear to be normal, being soft and easily broken. On February 17th put some camphor leaves, having an abundance of eggs, into

*Hubbard in "Insect Life," Vol. VII, pp. 281, 282.

a tumbler. On March 7th there was only one living mite and the eggs were still red in color, but they were not normal nor had they hatched. They were soft, and when broken contained a liquid instead of a young spider. Another collection of leaves made just after the freeze and examined on February 15th, gave the same results; the eggs did not hatch. On another tree there were many unhatched eggs. On February 17th these appeared to be very soft. On these same leaves there were 13 young mites that had evidently hatched since the freeze. No doubt the adults, young mites and eggs were largely killed when in exposed places.

In fairly well protected spots the adults and young were not killed. On February 29th there were 23 adult females, 8 males and 10 young mites living on a few camphor leaves. The eggs, however, did not appear to be normal. They had that same dull look as the others that never hatched.

The observations on this mite show that all stages are easily affected by the cold, and especially are the eggs damaged, which is contrary to expectations. The adults survive only in protected places. On June 1 there were practically none of this species present, while there are specimens of *Tetranychus sexmaculatus* and *Tetranychus citri*.

NOTES ON SOME INSECTS OF SOUTH FLORIDA IN 1917

By R. N. WILSON

(Paper given before the Florida Entomological Society.)

The above title is somewhat too inclusive, as the observations were made almost entirely in Palm Beach County, tho some were made in other counties.

Dictyophorus reticulatus—The Lubber Grasshopper. These large grasshoppers were very numerous on some of the drained saw-grass lands along the Palm Beach Canal in the Everglades, but because this land has not yet come under cultivation little damage resulted. Along the shores of Lake Okeechobee where severe injury has resulted from their attack during certain years, these grasshoppers were present in small numbers, but were not troublesome. The writer's previous experience with this species at Fellsmere and other points had proved that it could be controlled with the so-called "Kansas Mixture" (bran, paris green, syrup and citrus fruit) even when there was a large influx from surrounding lands. None of the melanic forms were found, as would be expected from the known distribution of the various forms.